

REMARKS

**I. Status of the Claims**

Claims 1-36 were originally filed. Claims 14-24 were initially elected in response to a restriction requirement. Applicants acknowledge with appreciation that claims 25-27 have been allowed to rejoin the elected claims upon Examiner's reconsideration of the requirement. Non-elected claims 1-13 and 28-36 have been canceled.

Upon entry of the present amendment, claim 16 is canceled. Claim 14 is amended to import the limitation of claim 16 and to recite that the vanadium haloperoxidase polypeptide "has a molecular weight of no more than 40 kDa." This added recitation is fully supported by the specification, *e.g.*, in Figure 3, and introduces no new matter. Claims 14, 15, and 17-27 are currently pending.

**II. Objections**

The Examiner objected to the specification for failure to include a statement indicating the relationship of this application to earlier filed applications. Applicants note that such information has already been included in the preliminary amendment filed October 21, 2003, which further corrects some typographic errors in the specification. In this response, the specification is further amended to update the priority information.

The Examiner also objected to claims 14, 17, and 18 for various informalities. These claims have been amended to address the objections.

**III. Claim Rejections**

**A. 35 U.S.C. §112, Second Paragraph**

Claim 14 was rejected under 35 U.S.C. §112, second paragraph, for alleged indefiniteness for using the term "catalytic helical frame." Following the present amendment, claim 14 now recites "catalytic domain" instead. Applicants submit that "catalytic domain" is a term commonly used in the art and understood by the skilled artisan as referring to the domain of an enzyme responsible for its activity, and in this particular case, referring to the domain of a

vanadium haloperoxidase necessary for the binding of a vanadium ion and the oxidation of ODA. There is no ambiguity associated with the term "catalytic domain."

The withdrawal of the indefiniteness rejection is respectfully requested.

**B. 35 U.S.C. §112, First Paragraph**

***Written Description***

Claim 14, 15, and 25-27 were rejected under 35 U.S.C. §112, first paragraph, for alleged inadequate written description. Applicants respectfully traverse the rejection in light of the present amendment.

Possession of claimed invention may be shown by a variety of descriptive means, including words, structure, figures, diagrams, and formulas. MPEP §2163 I. Case law provides more specific guidance in setting the standard for written description.

The amended claims are now directed to polypeptides comprising a vanadium haloperoxidase polypeptide. This vanadium haloperoxidase polypeptide has the following features: (1) it consists of a catalytic domain that complexes a vanadium ion and catalyzes the oxidation of ODA; (2) it comprises an amino acid sequence at least 70% identical to the 435-632 segment of SEQ ID NO:2; and (3) it has a molecular weight of no more than 40 kDa. These claims fully comply with the requirements for written description of a chemical genus as set forth in *University of California v. Eli Lilly & Co.*, 43 USPQ2d 1398 (Fed. Cir. 1997). As described by the Federal Circuit in *Lilly*, “[a] description of a genus of cDNAs may be achieved by means of . . . a recitation of structural features common to the members of the genus . . .” *Lilly*, 43 USPQ2d at 1406. Furthermore, the court in *Fiers v. Revel* stated that an adequate written description “requires a precise definition, such as by structure, formula, chemical name, or physical properties.” *Fiers*, 25 USPQ2d 1601, 1606 (Fed. Cir. 1993).

On the other hand, proper description of functional features of a claimed invention can also play an important role in satisfying the written description requirement. The Federal Circuit recently stated that “*Lilly* did not hold that all functional descriptions of genetic material necessarily fail as a matter of law to meet the written description requirement; rather,

the requirement may be satisfied if in the knowledge of the art the disclosed function is sufficiently correlated to a particular, known structure." *Amgen Inc. v. Hoechst Marion Roussel Inc.*, 65 USPQ2d 1385, 1398 (Fed. Cir. 2003).

With regard to the claimed polypeptides, pending claims set forth commonly shared structural features of the claimed polypeptides by providing a percentage sequence identity to a reference sequence (e.g., 435-632 of SEQ ID NO:2). The claimed polypeptides are therefore effectively described structurally. Commonly shared functional features of the claimed polypeptides are also provided: each comprises a vanadium haloperoxidase polypeptide that is capable of complexing vanadium ion and catalyzing the oxidation of ODA. These functional features can be readily tested by one of ordinary skill in the art using well established, routinely practiced techniques as well as according to the teaching of the present specification (see, e.g., page 25, lines 17-29, and page 28, line 24, to page 29, line 6). In addition, several exemplary polypeptides of the claimed genus are described in the specification, see, e.g., Figure 3.

Thus, both structural and functional features commonly shared by the claimed genus of polypeptides have been described in detail, and multiple examples are provided, which "clearly allow persons of ordinary skill in the art to recognize that [the applicant] invented what is claimed." *Vas-Cath Inc. v. Mahurkar*, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991). Such description is consistent with the written description standards set forth in both *Lilly* and *Amgen*.

Applicants believe that the claimed invention within the current claim scope is properly described by the specification under 35 U.S.C. §112 first paragraph. As such, the withdrawal of written description rejection is respectfully requested.

#### *Enablement*

Claims 14-17 and 19-27 were rejected under 35 U.S.C. §112, first paragraph, for alleged lack of enablement. Applicants respectfully traverse the rejection in light of the present amendment.

A claimed invention is enabled when the disclosure allows one of ordinary skill in the art to make and use the invention without undue experimentation. MPEP §2164.01. The test

for enablement as set forth in *In re Wands*, 8 USPQ2d 1400 (Fed. Cir. 1988), requires the consideration of multiple factors: the breadth of the claims; the nature of the invention; the state of the prior art; the level of predictability in the art; the amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation needed to make or use the invention based on the content of the disclosure.

In the present case, the claims are directed to polypeptides comprising a vanadium haloperoxidase polypeptide, which has well-defined structures and readily testable functional features: *e.g.*, consisting of a catalytic domain that complexes a vanadium ion and catalyzes the oxidation of o-dianisidine (ODA); comprising an amino acid sequence having at least 70% sequence identity to the sequence from residue 435 to residue 632 of SEQ ID NO:2; and having a molecular weight of no more than 40 kDa. The claimed genus of polypeptides is therefore not overly broad.

This invention relies on the basic techniques of molecular biology and biochemistry. As the Examiner has acknowledged, the level of technical sophistication is high in the art, which would sufficiently allow one ordinarily skilled artisan to produce a large number of polypeptides within the claimed genus, based on the exemplary vanadium peroxidase sequences disclosed in this application.

The specification contains ample directions to practice the invention, such as methods of cloning and modifying the coding sequences for vanadium peroxidase polypeptides (*see, e.g.*, page 13, line 30, to page 15, line 6; page 19, line 23, to page 21, line 29; and Table 1 on page 22), expression of the polypeptides (*see, e.g.*, page 15, line 10, to page 19, line 21), and enzymatic assays for detecting peroxidase activity (*see, e.g.*, page 25, lines 19-27, and page 28, line 24, to page 29, line 6).

While Applicants do not dispute that some polypeptides that possess the described structural characteristics may not retain the catalytic activity of a vanadium peroxidase, such functionally inoperable embodiments can be easily identified and eliminated through enzymatic assays. Vanadium peroxidase activity can be readily tested according to the methods commonly used by those skilled in the art or the methods taught by the specification (*see, e.g.*, description

on page 25, lines 19-27, and page 28, line 24, to page 29, line 6). MPEP §2164.01 states, "[t]he fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation." In the present case, the necessary experimentation requires nothing beyond the use of routine techniques, such as modification of a polynucleotide coding sequence, recombinant expression of a polypeptide, and peroxidase activity assays, which is exactly what "the art typically engages in." Thus, the experimentation does not constitute undue experimentation.

Taken together, analysis of the *Wands* factors indicates proper enablement of the claimed invention. Applicants thus respectfully request the withdrawal of the enablement rejection.

C. 35 U.S.C. §102

Claims 14 and 16 were rejected under 35 U.S.C. §102(b) for alleged anticipation by Vilter *et al.* Applicants respectfully traverse the rejection in light of the present amendment.

To anticipate a pending claim, a prior art reference must provide, either expressly or implicitly, each and every limitation of the pending claim. MPEP §2131. As amended, claim 14 is directed to an isolated polypeptide comprising a vanadium haloperoxidase polypeptide, which has the following features: (1) it consists of a catalytic domain that complexes a vanadium ion and catalyzes the oxidation of o-dianisidine (ODA); (2) it comprises an amino acid sequence having at least 70% sequence identity to the sequence from residue 435 to residue 632 of SEQ ID NO:2; and (3) it has a molecular weight of no more than 40 kDa.

In contrast, Vilter *et al.* describe the partial sequence of a vanadium peroxidase from *Ascophyllum nodosum* (Table 2 on page 350), whose molecular weight is not provided. Although the article contains a general reference to other publications describing the molecular weight of peroxidases to range from 40 to 97 kDa (the bridging paragraph between pages 347-348), there is no evidence the peroxidase with an apparent molecular weight of 40 kDa is the same enzyme as the one whose partial sequence is provided in Table 2. Thus, it has not been established that the Vilter *et al.* reference discloses or suggests a vanadium haloperoxidase.

polypeptide comprising the limitations of claim 14. Accordingly, the anticipation rejection should be properly withdrawn.

D. 35 U.S.C. §103

Claims 20-24 were rejected under 35 U.S.C. §103(a) for alleged obviousness over Vilter *et al.* in view of the common knowledge in protein purification, as exemplified by Ford *et al.* Applicants respectfully traverse the rejection in light of the present amendment.

In order to establish a *prima facie* showing of obviousness, three requirements must be satisfied: all limitations of a pending claim must be expressly or impliedly disclosed by prior art references; there must be a suggestion or motivation in the art for one skilled artisan to combine the limitations; and there must be a reasonable expectation of success in making such a combination. MPEP §2143.

As discussed above, the Vilter *et al.* reference does not provide all limitations of claim 14, it therefore does not provide all limitations of claims 20-24, which depend from claim 14. Since the common knowledge in protein purification (as exemplified by Ford *et al.*) does not supply the missing limitations either, not all claim limitations are present in the cited references. Consequently, no *prima facie* obviousness is established based on Vilter *et al.* and Ford *et al.* Applicants therefore respectfully request the withdrawal of the obviousness rejection.

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Amdt. dated December 27, 2004  
Reply to Office Action of October 8, 2004

PATENT

**CONCLUSION**

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,



Chuan Gao  
Reg. No. 54,111

TOWNSEND and TOWNSEND and CREW LLP  
Two Embarcadero Center, Eighth Floor  
San Francisco, California 94111-3834  
Tel: 415-576-0200  
Fax: 415-576-0300  
CG:cg.  
60369953 v1